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RADIUM

EDITED BY
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VOL. VI NOVEMBER, 1915 No. 2

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A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY
PHYSICS AND THERAPEUTICS OF RADIUM
AND RADIO-ACTIVE SUBSTANCES

RADIUM

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY, PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES.

Edited and Published by Charles H. Viol, Ph. D., and William H. Cameron, M. D. with the assistance of collaborators working in the fields of Radiochemistry, Radioactivity and Radiumtherapy.

Subscription $2.50 per year, or 25 cents per copy in the United States and Canada in all other countries $3.75 per year.

Address all communications to the Editors, Forbes and Meyran Avenues, Pittsburgh, Pa.

VOL. VI. NOVEMBER, 1915 No. 2

RECENT CONTRIBUTIONS TO RADIUM THERAPY

W. H. B. Aikins. (Toronto). Radium and Trichloracetic Acid in Dermatology. The Canadian Practitioner and Review. Vol. XL, No. 10, pp. 479-89, October, 1915. "In this paper I desire to discuss two agents which have proved invaluable to me in the treatment of certain diseases of the skin. It may seem strange that these two materials have been linked together in this title, instead of dealing with each agent separately, but when it is considered that in many cases radium and trichloracetic acid are complementary one to the other, it will be more readily understood why such a title was chosen."

"The use of radium and its great value in the treatment of certain affections has of course been recognized for years. Ever since Wickham founded the first Radium Institute in Paris and put radium therapy on a sound scientific basis, evidence continues to accumulate as to the great value of this therapeutic agent when properly used."

"My attention was first drawn to the use of trichloracetic acid as a valuable adjunct in treating skin lesions by my friend Dr. Douglass Montgomery, of San Francisco, who found it valuable in the treatment of seborrhoeic and senile keratosis. Trichloracetic acid occur as white deliquescent crystals, having a melting point of 55° C. and readily soluble in water. It is a substance which has been in use for some time among dentists and laryngologists, but very little reference to it is found in medical literature. In many cases it has been supplementary to treatment by radium. Like the latter the scar left after its use is negligible, an excellent cosmetic result being obtained."

The most important effect of the acid is due to its keratolytic action. It dissolves horny epithelium. Montgomery showed this action by dropping some of the pure acid on shavings of horny epithelium. The shavings swelled up into a clear jelly, and on examination with a microscope an immense number of fat droplets were found along the inter-

cellular junctions. It gave an appearance as though the intercellular substance was principally attacked and the fat was being squeezed out of the tissue. Such being its action it can readily be seen why it has such a special use in the treatment of keratoses. The thickened cornified epithelium is softened and falls off as an eschar, leaving smooth almost normal appearing skin beneath."

"Technique.—The method of application is comparatively simple. When the tissue is much thickened a quicker result may be obtained if the dermal curette is first used to remove a large portion of the excresence."

"The acid may be applied either as the pure crystals or in the concentrated solution. A dressing probe or match point or glass rod makes an excellent applicator. The lesion to be treated must first be wiped thoroughly dry, alcohol or ether being used. The normal skin around may be protected by vaseline. The acid is then applied and rubbed in with some pressure. The tissue quickly becomes a dead white, and the patient complains of a stinging pain. When this occurs mop off the treated area with water until all burning sensation has ceased."

"In many respects the action of trichloracetic acid is similar to that of carbon dioxide snow, but it is much less painful, as practically all pain is removed by the mopping with water. It can also be used in the form of pastes."

"The dermatological conditions in which trichloracetic acid may be of service are many and varied. As has been mentioned, it is a most useful agent in the treatment of keratosis, and the proper treatment of keratosis is important on account of the frequency with which epithelioma develops from keratotic lesions. Occuring most often in the elderly, particularly those who during their life time have been exposed to the wind and sun a great deal, still it is not uncommon to see keratosis develop in those of middle life. Depending on the type of skin upon which they develop keratosis are hard, thick masses, which can be scraped off with difficulty, being as it were torn from the underlying tissues, or they are soft, greasy, friable and readily removed by light scraping, leaving the underlying skin soft, pultaceous and frequently undergoing epitheliomatous degeneration. Recognizing as we do the importance of removal of what we now regard as precancerous patches, the early treatment of such spots of keratosis cannot be over-emphasized. Radium is a most useful agent in their treatment, preferably employed after the removal of the crusts by a dermal curette. It is used in sufficient dosage to produce a mild reaction."

"Where many spots of keratosis are present, and the application of radium might be tedious and take up considerable time, the saturated solution of trichloracetic acid may be substituted. In a few minutes numerous spots may be treated, and without very much discomfort to the patient. Recurrences are rare."

"In the treatment of warts, moles and xanthoma it is very efficacious. If the wart or mole is much elevated above the surface of the skin, it is better not to attempt to destroy the whole lesion at once, but by successive applications gradually cause its disappearance."

"Lupus Erythematosus.—The intractability of this condition very often to treatment is well recognized, as is shown by the long list of remedies which various authorities mention for its cure. No routine plan can be adopted, for what is successful in one case may not produce so beneficial a result in another. Several cases have done excellently

by means of radium. Sometimes in the same patient certain of the lesions respond to radium, while others do not. One case of mine showed this in a marked degree. The patient had patches of lupus erythematosus on the cheek below the eyes, at the back of the ear, on the forehead and on the nose. She had had a prolonged series of treatments, when on the Pacific Coast and in Chicago with carbon dioxide snow with no benefit. After this she came to me. Under the action of radium the patches on the forehead, and behind the ear, and most of it on the nose disappeared, but the others would clear up for a time and then recur. Trichloracetic acid came to my notice about this time, and I used it on these stubborn patches with very gratifying results."

"Lupus Vulgaris.—Practically all authorities agree that the best results in the treatment of lupus are obtained by the use of the Finsen Light, but the tediousness of the treatment, and the difficulty the patient experiences in obtaining it render it not always the method of choice. Here radium exerts a remarkable influence, and if used in destructive doses causes retrogression of the diseased tissue, leaving as radium always does leave a good cosmetic result. For small isolated nodules use has been made of applications of trichloracetic acid, which is an agent of considerable value in such cases."

"Naevi.—For small naevi destruction by caustic action is often the most convenient method of treatment. I refer to lesions so small as to perhaps deserve to be called telangiectases rather than naevi. There are one or two fairly prominent, dilated capillaries. It is recognized now, I think, almost universally, that no method of treating these vascular new growths can be compared for cosmetic result with the general obliteration of the vessels brought about by the proper use of radium. Sometimes for these very small points quick action is desired, and patients will not devote the time required for treatment . Electrolysis is used, but as a rule the resulting scar is far more disfiguring than the original mark. Solid carbon dioxide has its advocates, and certainly good results are obtained from its use. It is a painful procedure, however, and if too much pressure is applied great destruction of the tissue may be produced and considerable scarring result. Trichloracetic acid in these cases acts well; it produces but slight pain during its application and the resulting scar is not disfiguring. One field where a wide sphere of usefulness exists is in the treatment of the telangiectases, which so often result after the use of X-ray. When destructive doses of X-ray have been used telangiectases, as it is very well known, are apt to develop."

"Radium.—Speaking more particularly of the use of radium in dermatology, one naturally turns at first to its value in the treatment of rodent ulcer, for of all forms of malignant disease this is the one in which radium is almost a specific. It was in the treatment of this disease that the therapeutic value of radium was first definitely established, and the way paved for the further research on its curative value in new growths."

"A great number of cases of rodent ulcer have come under my observation in the last few years, and it is one of the most satisfactory things in the practice of medicine, to note that the great majority respond readily to this treatment, and have remained cured over a period of years. It is true of course that certain cases do not respond as well as others. This is particularly so when all sorts of treatment, such as X-ray, CO_2, ionization, etc., have been previously employed. It would

appear that from being acted upon by so many different physical agents, the tissues have lost their vitality and their ability to form granulations, so that while the disease may be arrested complete healing does not occur. Then again where cartilage or bone is involved great care must be exercised in the dosage given, as too heavy exposure may produce a very painful and prolonged inflammation of the parts. Ordinarily, where such parts are not affected, I have found the most lasting results to follow sufficient dosage to produce quite a severe reaction. This reaction comes on about a week or ten days after exposure, and shows itself by inflammation of the part with later the development of a radium crust. In about six weeks this crust detaches itself and a smooth, supple, scarcely noticeable scar is left."

"The following cases illustrate the excellent results to be obtained from the use of radium, after other methods have proved ineffective."

"H. S., æt 54, referred by Dr. Charles McKenna, Toronto. A rodent ulcer developed on the right cheek eight years ago. Under the X-ray the ulcer healed, but broke down again in three or four months time. For 10 months he underwent treatment with the electric needle without result. When he first came under observation the ulcer was three-quarters of an inch in diameter, with a thickened margin and granulations covering its base. Following a single series of radium treatment healing took place. At the present time the condition is most satisfactory, there being a smooth supple cicatrix present."

"The second case was in a man of 39, referred by Dr. Baldwin, Benito, Manitoba. Five years ago an ulcer developed above the right eyebrow. With the exception of ointments no treatment was received for three years. During the last two years he had received treatment with carbonic acid snow, and had one application of the X-ray. The ulcer was one and one-half inches in diameter, and extended down to the bone. The edges were much thickened. A heavy radium exposure was given, following which healthy granulations formed and gradual cicatrization took place. Complete healing has occured."

"Epithelioma of the skin.—Radium used on squamous-celled epithelioma of the skin gives excellent results. Depending on the depth of involvement slight variations must be made as regards the length of application; screening the apparatus, etc. Where there is a good deal of thickening of the edge of the ulcer, or it tends to be fungating, preliminary curettage hastens the cure, the radium plaques being applied a few hours later. Prolonged exposures using heavily screened apparatus which emits only the harder beta and gamma rays, should be given, and healing takes place with a minimum of imflammatory reaction. Naturally the tendency of squamous-celled carcinoma to form metastases in the neighboring lymph glands must not be overlooked."

"One special use of radium in new growths of this nature is as a prophylactic following surgical removal. This is a wise procedure, and one which is quite firmly established as a routine measure in centres where special attention is devoted to the study of malignant disease. Certainly many cases in which one would ordinarily expect to have recurrences have been free from such by the combined use of operative procedure and post-operative radiation."

"Epithelioma of the Lip.—Although not in the strict sense of the term a dermatological lesion, yet certain cases have given such satisfactory results with radium that one may perhaps be pardoned for referring to it. When the ulceration is superficial and the lesion is freely movable on the underlying tissues, in my experience radium

furnishes a clinical cure, and from its ease of application and little discomfort to the patient is the method of election. I have seen cases previously operated upon, with recurrence, clear up completely under its use."

"The two cases illustrated show what may be expected from the proper use of radium. One was that of a man 55 years of age, referred by Dr. H. L. Anderson, Niagara-on-the-Lake. It had begun as a small ulcer three years before. When he came under observation almost all of the red surface of the lower lip was involved, presenting a central ulcerated portion surrounded by a hard margin. The thickened edges were curetted and a heavy exposure to radium given, resulting in a fairly severe reaction. Two months later the lip was quite healed."

"In a man of 77, referred by Dr. W. J. Wilson, Toronto, there was present an epithelioma on the left side of the lower lip, which had been cauterized by his physician without result. The patient was so feeble that operation was not to be entertained."

"The ulcer was as large as a ten cent piece with indurated base and edges. Twelve hours exposure with a plaque containing half a centigram of radium was given. In ten days a crust had formed which detached itself in about six weeks' time, leaving a perfectly smooth healed surface."

"Warts and Papillomata.—These benign growths of the skin yield readily to comparatively short exposures to radium. The importance of having such treated cannot be over-emphasized when one considers the frequency with which malignant disease of the skin develops on the site of a pre-existing papillomatous growth."

"Acne Vulgaris and Acne Keloid.—Chronic cases of acne vulgaris particularly when associated with scarring respond well to radium rays."

"Keloid.—This disfiguring condition met with not uncommonly after severe burns yields to no method of treatment as it does to radium. It would almost appear that keloid tissue was specifically influenced by the radium rays, and the prognosis is excellent when the lesion is not of too long standing. When the keloid is painful radium exerts a distinct anaesthetic effect. If screened applicators are used for a prolonged period of time a gradual absorption of the keloid tissue may be brought about without any surface irritation. This method of course takes longer, and if time is a factor of importance, unscreened plaques may be used, and a destructive reaction produced."

"A patient referred by Dr. H. A. Bruce had a severe burn involving the dorsum of both hands, and extending up the forearm. In healing an enormous amount of keloid tissue was formed, so that she was unable to move the wrist or bend the fingers of the left hand. She had a prolonged series of X-ray treatments without result. Her surgeon asked me to use radium which I did, with already a marked improvement. The keloid thickening is much diminished, in some places almost gone, the wrist is quite movable and the fingers also. Treatment has had to be suspended for some weeks owing to advanced pregnancy, but I hope to renew it shortly. The prognosis is excellent for the keloidal tissue to become all absorbed."

"Naevi and Angiomata.—For the treatment of these disfiguring marks radium gives us a therapeutic agent which readily supersedes all other means which previously had been employed. As regards the flat port wine stain the prognosis depends on the ease with which pressure will cause a blanching of the mark. If gentle pressure suffices to expel

the color a very optimistic view may be entertained as to obtaining a good cosmetic result. Radiation is given in sufficient dosage to cause just a slight superficial reaction. This is repeated from time to time until fading has been produced. The keynote to success in the obtaining a good permanent result in these cases is to be content to proceed cautiously. One must be prepared to keep the patient under observation for a considerable period of time, giving treatment as indicated, and on no account to hurry. Moreover, one finds that with these cases the personal factor must be taken into more than ordinary consideration, and great care exercised that too much reaction is not produced. If one does unavoidably give too long an exposure to a patient with an exceptionally sensitive skin, telangiectases are apt to subsequently develop."

"Angiomata.—These do exceedingly well under radium rays and are best treated by screened plaques applied for longer periods. In this way a gradual shrinking of the mass is brought about without surface reaction. This is important because where the growth is so vascular there is some danger of hemorrhage if ulcerative reaction should be produced. In these cases it is often possible to employ 'cross-fire,' a method devised by Wickham for producing as it were a concentrated fire on a tumor mass. Plaques are placed on opposite sides of the growth so that the tissues are supplied by a large vessel, as evidenced by pulsation, the manner in which they appear to melt away, is most gratifying."

"Lupus Erythematosus.—I have already spoken of the value of radium in Lupus Erythematosus. The difficulty of curing this disease is well recognized. Radium has however in some cases where not much previous treatment has been used been productive of good results, and the lesions have permanently disappeared. In using it treatment should be applied to the tissues surrounding the lesion as well as to the actual lesion itself."

"Lupus Vulgaris.—Used in a destructive way, radium acts with good effect in this condition. Heavy doses must be given, and as in lupus erythematosus the surrounding tissues treated. Radium has a peculiar scope in the treatment of lupus in situations as within the nasal cavity."

"Pruritus.—The application of radium has a marked analgesic action, and this is well seen in the treatment of certain persistent cases of pruritus. Short exposures of strong plaques will relieve the intolerable itching after all other methods, including cauterization, X-ray, etc., have failed."

"Chronic Eczema.—A similar satisfactory result may be obtained in the treatment of patches of chronic eczema. A dosage sufficient to produce a mild stimulation will result in the clearing up of persistent thickened patches which have resisted all other treatments."

"Acne Rosacea and Rhinophyma can now be treated successfully with radium, as well as certain parasitic diseases and tuberculosis of the skin."

* * * * *

F. Dautwitz. Mitteilungen aus der K. K. Kuranstalt fuer Radiumtherapie in St. Joachimsthal. Erstes Heft. Die Radiumbestrahlung. (Radium Irradiation). With 7 cuts and 33 plates. pp. VIII and 154. Wilhelm Braumueller, Vienna and Leipzig. 1915. ($2.) This very valuable and interesting book by Dr. Dautwitz is divided into two parts. The first gives technical information in regard to the preparation of the

Joachimsthal Radiumtraeger (applicators) and the technic of radium application. Filters, methods of application, duration of application, dosage, and the general effects of radium rays are discussed in detail. The second part deals with particular phases of radium therapy. Under dermatological conditions the use of radium in the treatment of pruritus, chronic eczema, psoriasis, acne rosacea, lupus erythematosus, tuberculosis of the skin, verruca, cornu cutaneous, fibromata, haemaangiomata, and skin carcinomata is described (48 pages). Radium treatment of malignant tumors affecting the head and neck, body and extremities is discussed (53 pages). There are forty detailed case reports dealing with the various conditions which are discussed.

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Robert Abbe, M.D. (New York). Lymphangioma and Radium. Medical Record, LXXXVIII, pp. 215-17, August 7, 1915. Read before the American Surgical Association, June 11, 1915, at Rochester, Minn. "In working out the problem of the utility of radium in the surgical field, it is evident that its supreme efficiency lies in the effective change, wrought on tumor cell growth, neither destructive nor constructive, but alterative. That there is such a specific action is shown in several types, most typically in myeloid tumors, massive growths of soft tissue, constituted of marrow cells of bone, which have overgrown, absorbed the bone surrounding them, and destroyed its form and usefulness, thus by its destruction justifying its classification as malignant."

"When the proper dosage has been given the tumor shrinks, gritty bone forms here and there in the pultaceous mass, general ossification follows, and the bone takes on its normal outlines as the shrinking progresses. Finally, the restored bone remains normal indefinitely, cases remaining well ten years to date."

"The same specific action is also shown in basal cell epithelioma, in round cell sarcoma, in all papilliomas and hyperkeratoses, and in myomas of the uterus. This legitimately called specific action is not a restorative one."

"To this growing list I would add one that takes up a new field which though not so large is equally important—that of lymphangioma. The first case that interested me was one of a massive tumor of the tongue. It is a well-known type of tumor of the tongue which combines overgrowth of blood and lymph vessels, plus coincident cell hyperplasia making a massive affair, unmanageable and deforming-a hemolymphangioma. For this trouble so great an authority as Butlin voices the experience of the world, that there is no resort but that of cutting out great masses from it, or if possible all of it. Experience further shows, as I shall soon demonstrate, that even this sometimes fails."

"The case shown was that of a young man who at seven years of age began to have an enlargement on the left half of the tongue. In three years it was a full overgrown mass, intermittenly bleeding severely and affecting seriously his speaking and eating. At fourteen years of age I saw him and applied radium to it. In two months it showed notable change for the better. Year by year it shrank, under occasional treatments, given only at three months intervals. After four years the tongue surface has its normal color and papillary appearance, showing a retrograde to normal."

"To the uninitiated four years sounds like a long time to give treatment, but one must remember that in all new fields the observer has to feel his way along cautiously and judge of the proper curative dosage of radium, without injury to the tongue. At the present time

much of the same result could be obtained in perhaps a quarter of the time."

"In a second case a tumor appeared in the interior part of the tongue of the daughter of a Boston physician. This was cut out by able surgeons. It recurred in two months. After it had grown larger and more threatening it was again cut out and pronounced sarcoma. It recurred, and was for the third time cut out and microscopically regarded as lymphangioma. The future seemed hopeless for cure by excision. She was brought to me with a bean-shaped recurrence in the scar. This I radiumized well by Wickham's crossfire method for one hour. It rapidly melted away in six weeks and the tongue has remained normal for over a year."

"A third case of hemolymphangioma of the tongue came to me recently in a man who was annoyed by a small raised purple growth on the side of his tongue, which was to a large extent naevus, but had the firm consistency of a pearly tissue combined with the enlarged vessels. Its recent appearance and characteristic quality on close study decided me to treat it without excision as a hemolymphangioma. One radium application to create good reaction has produced a cure, all angiomatous and overgrown lymph structure being replaced by a simple cicatrix."

"An unusual type of extensive nevus of the entire right leg in a seven year old boy was presented to me last year which had developed hyperkeratosis over much of its surface, with deep lying masses of tissue, varying from an eighth to half an inch in thickness, and in many places ulcerated and bleeding from a curious granular surface of purplish color. The child had been taken to many surgical clinics in the country with hopeless prognosis, and was finally referred to me by Dr. J. B. Murphy of Chicago. I recognized a condition analogus to that of the lymph hemaangioma of the tongue, and asked the critical diagnosis of Professor George T. Elliot without prejudicing his opinion by my own. He studied the margins of the surfaces, which showed raised and striated crepelike angioma, and called my attention to great numbers of small white vesicles scattered everywhere which could be nothing but lymphangioma, combined with the hemaangioma structure, thus fixing the diagnosis and explaining the unusual exulcerated masses and ridges over much of the diseased area, and which were not arranged anatomically like vessels, but like overgrown lymph channels choked with cells. I then expressed the belief that radium ought to cure the lymphangioma as it certainly would the nevoid condition."

"The technical methods of using radium taxes the operator's ingenuity, but being a new field will not be detailed here. Suffice is to say that steady progress has been made and a promise of ultimate cure can be asserted."

"Another rare type of pure lymphangioma was presented to me by Dr. George T. Jackson of New York and Dr. Engman of St. Louis, in the case of a little girl who had a congential group of vesicles on the skin of her neck below the hair line on the right side, extending downward two inches and a half by an inch and a half wide. In this space were packed a hundred white glistening vesicles, the size and height of rice grains, constituting a notable deformity. Occasionally one would rupture, occasionally one would turn black and dry up. I am inclined to explain the latter by union of a capillary bloodvessel with the dilated lymphatic, thus in a feeble form simulating the other enormous tumors with interchange of the lymph and blood capillaries. One application of radium to this patch of pure lymph angiomata for one hour and a half

caused a sharper reaction with rapid disappearance of all but six marginal vesicles, to which at four months' interval a second treatment has been given. Photographs of plaster casts taken before and after treatment are most convincing."

"A second case of pure lymphangioma of the skin of the neck of a four year old child has also received radium treatment lately. It is the exact counterpart of the one just narrated. Not the least interesting occurance was the occasional filling of white vesicles with blood, or at times breaking and discharging clear fluid. Before coming under my care the patch of vesicles, measuring one inch in diameter, had been treated, first by caustics and then by freezing. A keloid scar remained at the margin of which were a few lymph vesicles. A most interesting statement was made by the mother that a new crop of vesicles had come up through the scar. This shows that the caustic had not obliterated the lymphangioma."

"In this brief series of six cases my endeavor has been to show that by culling out similar types from thousands of various surgical cases treated by this wonder working agent, we are slowly accumulating evidence of the unique and specific action of radium, whose essential output is a discharge of beta rays, negative electrons—which in some mysterious way restore order to the disordered cell growth."

"The public hue and cry for a specific cancer cure has but a remote interest to the scientist, who uses radium only for what beneficial effects he obtains. Certain it is that in the broadening field of its successes it fills a need that no other agent does. Incidently it transpires that the virulent scirrhus types of cancer, so dreaded by all, is not cured by radium as now used."

"The output of radiant energy from radium and that from the Roentgen tube are alike as far as the neutral gamma radiation goes, but this has been shown to be efficient only by its development of beta rays—the negative electrons—which alter the cell growth. On the one hand the X-ray output is a gamma discharge, creating betas in the tissue on meeting resistance; on the other, radium emits a free discharge of beta electrons with enormous energy and short range. This explains satisfactorily why the local action of radium is so intense and efficient on lesions lying near or upon the surface, and why it also reaches deeper, when the beta rays are screened off, and long exposures are permitted. In the lymphangioma structures which I have described great depth is not desired in treatment. Hence the success following its application."

"What the rationale of its efficiency is must be conjectured. Certain it is that charging up the disordered cells of the tumor with negative electric particles shot into them in proper quantity completely changes their habit of growth and restores them to permanent healthy action."

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Joseph Zeisler. (Chicago). An Uncommon Case of Multiple Benign Sarcoid of the Skin. Journ. Am. Med. Assn. LXV, pp. 764-7, Aug. 28, 1915. A report of a case of multiple benign sarcoid of the skin, with lesions well distributed over the body. "Treatment.—A variety of measures, both local and constitutional, were employed in the treatment of the patient."

"Roentgen rays were used over many of the lesions, and while there resulted a marked reaction, the effect seemed slight and nowhere was there a complete involution."

"Mercurial plaster and various salves made little impression."

"Freezing with carbon dioxide snow, which was practised on a

number of the tuberous lesions, caused a violent reaction, followed by an almost complete disappearance of the same."

"Radium was consistently applied to a few selected small tumors, with moderately beneficial effect."

"Arsenic was employed both internally and by way of injection. At first elarson was used in large doses for several weeks; then Fowler's solution in increasing strength, both without much apparent benefit. Only the intravenous injection of sodium cacodylate, used in weekly intervals for several months, seemed beneficial. But while the patient at the present time (June 1, 1915) is greatly improved, particularly as far as the facial appearance is concerned, he seems far from a perfect recovery."

* * * * *

Arthur Burrows. (Radiologist to the Radium Department, Manchester Royal Infirmary; Manchester, England). The Radium Treatment of Cancer of the Cervix of the Uterus. Am. Journ. of Surgery, XXIX, pp. 296-8, August, 1915. "The results of radium treatment of carcinoma of the cervix uteri are so promising that it is worthy of special consideration, but it is first necessary to remember the limitations of radium."

"So far as is definitely known at present, the action of radium is purely local. It has no effect, adverse or favorable, in the formation of metastases. One cannot expect from it, therefore, in the present stage of knowledge, any effect on a distant secondary deposit. There may be a future in general treatment by radium, but this does not seem to lie in the administration of radium itself, but rather, as suggested in the Middlesex Hospital Reports, in the injection of radiated cancer cells, or the modification of a primary local dose of radium to produce a similar effect. Practically, therefore, local treatment can alone be considered now."

"It is probably that the original idea of an almost unlimited range of action for radium rays is wrong. It seems likely that β- and γ-rays are effective in destroying cancer cells at a comparatively short distance. Thus, when sections of malignant tissues are examined, which have previously been irradiated, they show:

"(1) Near the location of the tube, a complete local destruction of all tissues;

"(2) At slightly increased distance after an interval there is a more or less gradual destruction of malignant cells, but still overgrowth of connective tissue;

"(3) Still more distant there is only a partial destruction of malignant cells, but still overgrowth of connective tissue;

"(4) Finally, one passes to a distance at which the radium has had no effect."

"It has not been possible so far to measure those distances. This difficulty arises because of the large number of factors involved in radium treatment; thus, some tumors react more readily than others, in addition to which the amount of radium used, the thickness of the metal screen surrounding it, and the time of exposure are all variable factors."

"When radium was first used in malignant disease it was customary merely to place it in contiguity with the tumor to be treated. It was difficult then to exhibit adequate dosage without marked local inflammation and destruction of the vaginal mucous membrane. Tubes of radium were merely placed in the vagina, and had to be surrounded by a thick

screen of dense metal-e. g. 1.5 to 2 mms. of lead or platinum, which cut off the less penetrating but more irritating rays. This reduced the active rays by an enormous percentage. Unfortunately, in their passage through metals, radium rays produce secondary irritating ones which vary in numbers roughly with the density of the metal screen employed, so the screened tube had to be enclosed in India-rubber about 2 mms. thick to cut off as far as possible the secondary rays."

"Even under these circumstances exposures had to be limited to 24 hours, and then sometimes a moderately severe vaginitis would occur. With this method much amelioration of symptoms often occurred, but it was recognized that something more was wanted."

"It is well known that skin and mucous membranes react the most markedly of any tissues to secondary or other irritating rays. It thus becomes obvious that instead of using very thick screens, which reduce the effective energy of the radium enormously, thinner screens could be used by employing the tissue of the tumor as a screen. Thus the rays previously cut off could act on the tumor surrounding the tube, which in its turn would screen the more distant and irritable tissues. In this way even the secondary radiation from the metal would serve a useful purpose. Moreover, an appreciable percentage of very penetrating rays are cut off by thick screens."

"So radium in doses of 25 to 50 mgs. of the metal in a cylindrical screen of 1 mm. of silver (which cuts off all beta rays) were introduced into the canal of the cervix. The same exposure of 24 hours was continued and results improved. Ulceration cleared up more rapidly and a number of cases became operable."

"As mentioned, however, the range of effective action of radium rays is limited and with the use of a single central tube outlying malignant processes tended to escape with little alteration. It therefore became necessary to try to produce a more even radiation throughout the tumor."

"Stevenson of Dublin, had this idea in view when he started using radium emanation in small steel needles, the walls of which are 3/10 mm. in thickness. He maintained that it was necessary to use the softer and more destructive rays and that this could be done by employing small doses of 4 to 10 mgs. in each needle. These needles, in form like a serum syringe needle, are easy of introduction and a number of them can be pushed into a tumor very readily."

"It follows, however, from the small quantities of emanation used, and the high proportion of the soft rays employed, that these needles must have a very limited distance efficiency although very potent locally. Thus great care must be taken not to have the needles too near together (Stevenson recommends about 2 cms. between them) otherwise a very violent reaction is apt to occur."

"It seems, therefore, that to some extent the needles fail to produce that evenness of radiation which is desired, and although in many cases they produce very good results, their effect taken as a whole is intensely local."

"I accordingly modified my practice to a combination of the older and the newer method, and employed a system, which uses a strong central tube in the canal of the cervix, reinforcing its action on notable outlying malignant processes by means of the needles. This method has also the advantage of appearing to be safer."

"Thus, suppose the case to be treated has ulceration of the cervical canal, much thickening of the posterior lip, and two or three, according

to the size of the tumor, are introduced laterally into the base of the left broad ligament. The whole series of tubes is kept in position by packing the vagina with sterile gauze. After 24 to 48 hours the tubes are removed. The vagina is douched once or twice daily for six weeks afterwards to prevent the possible formation of adhesions."

"The small sharp platinum tubes of 0.3 mm. wall thickness, as used at the London Radium Institute, may be employed in the same way as the needles. They have a greater range of action, but need much more emanation, and are more difficult to introduce."

"It would seem that the above method produces better the even radiation desired, and distant troublesome foci are effectively dealt with."

"It has been stated above that at present only the local action of radium can be used, and although every effort must be made to make the local effect of the rays as wide as possible, nothing can be done for secondary abdominal glands. This leads the way to taking a wider view of what should be done in all cases of inoperable carcinoma of the cervix. Unless the surgeon has grown pessimistic about his results, radical amputation of the uterus should always be performed when possible."

"It is, of course, only to be expected that these cases which are just beyond operation should do the best with radium. Some patients whose disease is much more advanced, however, respond in a remarkable manner, while some, not apparently so hopeless, do not improve so much."

"It is difficult to find a reason for this discrepancy. It may be said that in some patients the resistance to cancer is greater than in others, and that their connective tissues respond more readily to stimulation and rapidly takes up the work of repair. This may certainly be a factor because it is notorious that radium is much the least happy in its results when the tumor to be treated is situated in the midst of dense old scar tissue, or is adherent to bone, with or without damaged skin stretched tightly over it. In these cases the tumor does not do well and the absence of tissue that can adequately repair defects seems to be the important factor. Thus, a carcinoma of the cervix of great bulk may in effect present these adverse features."

"The histology of carcinoma of the cervix is well known to be a difficult study, but its further elucidation might easily be the key of the problem. For, on the whole, those cases of carcinoma of the neck of the uterus which have their origin in the canal and extend chiefly through the thickness of the wall laterally and downwards, even though they form large polypoid growths, seem to respond best, although exceptions to this rule appear to exist. These may be glandular carcinomata even though they may have a tendency to change their form in the vagina."

"The type of cancer of the cervix which responds least to radium treatment is that which rapidly grows on to the vagina, and forms a deep ulcer with a high infiltrated edge or invades quickly the greater part of the vaginal wall and makes its upper part or the whole of it a hard, rigid tube. Such cases as these, although there are again exceptions, may hardly even show the ordinary improvement of decreased vaginal discharge and fetor and the stoppage of bleeding and pain."

"Fairly frequently in the course of radium treatment a cancer of the cervix seems to disappear almost entirely or an inoperable case looks clearly to have become operable. What line of treatment is then

advisable to take? After two or three treatments with radium it is usually possible to predict what further progress is likely to accrue from the same agent at the site of application. It must then be borne in mind that the object of the physician or surgeon is completely to eradicate the disease. If a secondary deposit, palpable or impalpable, exists in the abdomen, treatment so far has only been palliative, although it may have been successful to a remarkable degree. The rational thing to do, therefore, although unpleasant to the patient, is to open the abdomen in every hopeful case, and proceed as circumstances direct. This counsel of perfection has to be modified somewhat in practice."

"The patient may feel perfectly well and reject all experienced advice. This advice cannot be pushed too far because the patient may really be quite free of the disease. Moreover, should some of the cancer or secondary deposits remain, it may be extremely difficult to remove them. After radium treatment there is commonly formed around the lower part of the uterus and cevix a girdle of dense fibrous tissue which renders the separation of the uterus from the bladder and the dissection out of the lower parts of the uterus a very difficult matter. It may also be found impossible to remove glands in certain situations. Nevertheless, abdominal section should be performed when there is the slightest chance of removing the disease completely. If on opening the abdomen there are growths quite impossible of removal, tubes of radium, adequately screened, may be buried in them for from 24 to 48 hours, but, unfortunately, radium dosage is not sufficiently well worked out that one can be sure of removing a growth at one treatment, and repeated laparotomy is not tolerated by patients as a rule. General irradiation of abdominal glands by varnished plates of radium screened by 2 mm. of lead and protected against secondary radiation, placed over the abdominal wall for 24 hours is of little real use."

"If the metastases be in the liver the case is best left to its natural termination."

"Improvements in technic and increase of knowledge give great promise for the ultimately successful treatment of carcinoma of the cervix of the uterus by radium."

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C. von Noorden and A. Caan (Frankfurt a.M.). Radium Treatment of Hemorrhoids. Therapeutische Monatshefte XXIX, pp. 315-19, June, 1915. Radical operative measures by cutting or thermo-cautery in the removal of hemorrhoids are often refused, and the most of the bloodless methods have the disadvantage of not causing a complete removal of the larger and more inflamed nodules, and even after operative measures the nodules recur. In more severe cases d'arsonvalisation (high frequency) with a rod shaped electrode had not given good results. Nine cases have been successfully treated by the authors with radium. These cases were all moderately or very severe forms in which the pain was at times almost unendurable. About 27 mgm. of radium element (or the equivalent of mesothorium) was used, and no differences were found in the effects of radium or mesothorium. For the most part tubes were used, the radium capsules being placed in 3 to 5 cm. long brass tube having a 3 mm. wall thickness. The metal tube was screened with rubber to absorb secondary rays. The applications were made for two hours on alternate days, and repeated 7 to 14 times, according to the severity of the case. For some of the outer hemorrhoids flat placques were used, screened, as before, with 3 mm. of brass and with rubber. In all cases care was taken to screen the

unaffected parts, and it was found better to give a number of successive treatments, rather than several prolonged irridiations. Case reports on the nine patients show that in all cases there was a dimunition or disappearance of the nodules. However, it is too early to predict the final outcome of all cases, since most of the cases were treated in December, 1914, and January, February and March, 1915. There is no doubt but that the radium has a selective effect upon the hemorrhoids as is the case with malignant neoplasms.

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D. Bryson Delavan. (New York). The Effects of Radioactivity upon Nasopharyngeal Fibroma. Medical Record, Vol. LXXXVII, June 26, 1915, pp. 1056-58. "By nasopharyngeal fibroma is meant that rare form of growth which, composed mainly of connective tissue and highly vascular, usually takes its origin from the basilar process of the occipital bone, including the natural passages, creating pressure upon the parts in its vicinity, and in many cases giving rise to more or less frequent and abundant hemorrhages. The period of the greatest activity of its development is about the time of adolescence. Following this, the tendency to its enlargement diminishes and, in fortunate cases, if enough time be allowed and the conditions due to the presence of the tumor be not too urgent, it may gradually disappear. Such a result, however, is unusual. In nearly every instance the conditions arising from the presence of the growth are so serious as urgently to demand relief. This has been recognized for many generations, and a great number of methods of treatment for it have been devised."

"Heretofore, three varieties of treatment have been presented: (1) Removal of the growth after preliminary operation done for the removal of obstructing parts. (2) Removal through the natural passages by avulsion or with the cold snare, and (3) The reduction of the size and of the vascularity of the tumor by electrolysis or by the injection of various chemicals, followed by the removal of the mass thus reduced by means of the galvanocaustic loop."

"Of these methods, the first is illogical, unsurgical and, as statistics abundantly prove, deadly. Shock from the preliminary operation is severe; hemorrhage profuse, and recurrence common. In spite of this, it gained the support of the most eminent surgeons of almost two centuries, and even to-day still has its adherents. The second method is a vast improvement upon the first, but is nevertheless liable to provoke serious hemorrhage and shock and to be followed by recurrence of the growth. The third procedure is by far the best, as it is followed neither by shock, hemorrhage, nor the deformity resulting from the extensive removal of important parts. On the other hand, however, the application of the electrolytic needles is a tedious process and sometimes is attended with considerable pain."

"While the application of the needles and the manipulation of the galvanocaustic ecraseur require much experience and skill, nevertheless a statistical comparison of the three divisions of treatment above referred to leaves no doubt as to which is to be preferred. Thus, of 27 cases removed after severe preliminary operation in which the end results were stated, 59.25 per cent. were cured and 25.9 per cent. died. Of 41 cases removed through the natural passages by avulsion or the cold snare, 95 per cent. were cured, 5 per cent. died Of 66 cases treated through the natural passages by electrical methods, 100 per cent. were cured."

"For several years past much attention has been given to the treat-

ment of uterine and other tumors of the order of the fibromata or myxomata by means of the X-ray and of radium. Many cases have been experimented upon, and a sufficient number have been recorded to make it possible to begin to draw conclusions as to definite results. Both in the United States and Europe the method has gained strong advocates, and if in some instances the enthusiasm of these may seem unduly sanguine, even the most conservative must admit that the success attained renders the method at least worthy of the respectful consideration of the gynecologist; while the similarity of type between the uterine and the pharyngeal growth at once challanges the interest of the larynogologist, in the new method of treatment."

"The success of radium treatment in nasopharyngeal fibroma would not necessarily depend upon the absolute disappearance of the growth. It is a well recognized fact that nasopharyngeal fibroma, unlike other new growths, manifests its greatest activity during the years of adolescence and early youth. Towards the approach of the eighteenth year the tendency to its development steadily decreases. During this period the growth may diminish spontaneously and finally disappear. If, therefore, the size of the tumor can be controlled during the earlier years and until the period of its activity has been passed, nature herself will often intervene and by her own processes render artificial interference unnecessary."

"The most hopeful cases seem to be those of slow development occurring in older rather than in younger patients. But even in the case of rapidly growing tumors in patients far removed from the period of retrogression, the success attained by the use of radium in other types of fibroma would hold out strong hope for its usefulness in these. There is reason for believing, moreover, that the effect of the radium upon the growths is active and profound, and that more may reasonably be expected from its use than a moderate reduction in their size."

"To Dr. Robert Abbe of New York, belongs the credit of being the pioneer in the use of radium in the United States. For its application to various organs of the body he has originated many ingenious devices, none more so than the one intended for use in the nasal and nasopharyngeal regions. A description of this will be found interesting. In the application of radium, two objects are to be gained: First, the parts to be treated must be exposed to the rays, and, second, the healthy surrounding structures must be protected from them. It is not necessary that the radium should be introduced actually into the substance of the tumor. All that is required is the exposure to the rays of the surface of the growth, since the blood vessels of the tumor are more abundant near to its surface, and the rays penetrate at least a quarter of an inch, so that the treatment is entirely effective in accomplishing the desired result of profoundly affecting the circulation and thus causing by degrees the reduction of the size of the growth. In order to carry the radium to the desired part, Dr. Abbe uses the following simple methods:

"A tube of celluloid about 3/16 of an inch in diameter and with one end closed like the end of an ordinary test-tube, is cut to its proper length. In the bottom of the section of tube is put the radium. Upon it is packed a bit of cotton or gauze, to keep it in place. The end of a handle made of stout wire is thrust into the tube, and the tube is secured to the handle by a wrapping of adhesive plaster. For the protection of the normal parts, a piece of thin sheet lead, of proper size and shape, is adjusted to the outside of the tube and retained in place

by a sufficient wrapping of India rubber gauze, the side covered by the lead being directed away from the tumor."

"In using this device one of the nasal cavities of the patient is first locally anesthetized and the radium carrier, properly lubricated, is then passed backward through it until the radium is brought into proper relation with the growth. Proper regulation of the strength of the radium and of the duration of the exposure will prevent injury to the surrounding healthy parts. In a case of Dr. Cornelius Coakley's now under treatment in New York one application of radium has already produced remarkable results."

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John Guttman. (New York). Radium in Rhinoscleroma. New York Medical Journal, Vol. CII, No. 14, October 2nd, 1915, p. 711.

"Case. J. M., aged 26 years, the mother of two healthy children; family history negative. She knew of no one suffering from a similar affection. Native of Hungary and came to this country eight years ago. Her present illness dated back 16 years. She had been operated upon by different physicians in different dispensaries without the slightest improvement. She came under my care about six weeks ago, and then showed almost complete occlusion of both nostrils by a mass of hard fibrous connective tissue. The nasal aperatures were replaced by openings barely the size of a pin. The alae nasi were considerably harder than normal. In the pharynx in the region of the posterior pillar there was a hard white patch. Postrhinoscopic examination showed considerable purulent secretion, probably due to impeded drainage, anteriorly. The laryngeal surface of the epiglottis was covered with a small white patch. The superficial cervical glands were indurated on both sides. Wassermann negative. A section removed from the introitus naris showed Mikulicz cells containing a few diplobacilli of Frisch. For four weeks Mrs. J. M. has been treated by Dr. I. Levin with radium, with a marked improvement. Rhinoscleroma is a disease of endemic nature and is confined to localized regions, mainly to southern Russia and northern Austro-Hungary."

"Although rhinoscleroma in its developed state shows a well defined clinical picture which cannot be mistaken for any other disease, still as far as its etiology, pathology, and therapy are concerned nothing definite is known. The characteristic Mikulicz cells are considered by some authors to be a product of degeneration. Some authors believe the diplobacilli of Frisch to be identical with Friedlaender's pneumobacilli and to be considered only an accidental finding. The infectiousness of the disease is also questionable, and whereas Gerber and others demand quarantine for these cases, others, like Kaposi, do not believe the disease to be contagious. Our patient does not know of anyone in her family or among her acquaintances afflicted with a similar disease. There has lately been made some advance in the treatment of this malady. Fittig was the first to advise X-ray treatment. Later Kahler (Wiener klinische Wochenschrift, p. 839, 1905) reported cases treated successfully with radium. In our case the treatment with radium also proved to give some relief. It seems, however, that to obtain a complete cure, the treatment with radium will have to be continued for several months."

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Maunsell, C. B.: Cancer of the Tongue and Floor of the Mouth. Med. Press & Circ., 1915, xcix, 463. Reports from many workers draw special attention to the hopelessness of the treatment of cancer of

the mouth by means of radium applied by any of the previously known methods.

The author thinks this the first case which has been recorded of the obliteration of an extensive cancer of the tongue and floor of the mouth by any method of treatment other than excision. The method of treatment adopted is that which was originally and ably described by Joly and Stevenson in 1914, and consists in the introduction into the diseased area, by means of ordinary hollow metal needles, of known quantities of radium emanation without screening of any kind. The glass tubes and needles can be made of various lengths to suit individual cases.

For intra-oral work the author uses special needles made with an eye instead of a mount at the end, in order that they may be held in position by suture.

The patient, a man of 61, eighteen months previous had noticed a hard lump on the under surface of his tongue which gradually increased in size, later ulcerating and extending rapidly, causing much pain in his left ear and the left side of his face. The patient was thin and cachectic. The area involved the interior part of the tongue, fraenum, and floor of the mouth up to the mucoperiosteum of the jaw. Slightly enlarged glands could be felt in the left submaxillary region.

The report of microscopical section by Wigham is as follows: "Masses of cancer cells supported by fine strands of connective tissue, cells of squamous type showing many mitoses."

Six needles were introduced—two into the tongue, one on the interior side of the former position of the fraenum, four being introduced through the submental skin. The needles contained 23 millicuries of emanations, and were left 23½ hours. Two days later four needles containing 11 millicuries were introduced among the submaxillary glands and left there 24 hours. Two days later six needles containing 11 millicuries were again inserted four into the tongue and two into the floor of the mouth. These were removed in 26 hours. Light ether anaesthesia was used. The only reaction noted was an evening rise of temperature to 100° on the first two occasions. The pain soon ceased and in 48 hours the growth was softer and in seven days the glands were much smaller. In 22 days the ulcer was covered with normal looking epithelium, but considerable induration could be detected. Within the next 52 days the needles were inserted three times.

A piece of tissue was removed for microscopical examination and showed nearly normal epithelium covering the site of the cancerous area, some thinner, with slightly flattened papillae, fairly firm connective tissue with many blood vessels and some patches of round cells, some islands of muscle fibers, some of them degenerated; one small mass of cancer-cells differing from the other section in that the bodies of the cells were much smaller in proportion to the size of their nuclei. There were no mitoses and the cancer-cells were surrounded by foreign-body giant cells.

The patient was obviously cured, but on account of the remaining cancer-cells, notwithstanding they were changed and attached by giant cells, the author introduced six needles containing 16 millicuries into the tongue and area; these were removed in 48 hours. One month later a haemorrhage occurred from a sloughing area as large as a pigeon's egg. This was scraped out and the patient was healthy when last seen by the author a few days later.

The author considers the patient cured and thinks the last treatment might have been omitted or at least considerably reduced. Surgery, Gynecology & Obstetrics. October, 1915.

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Dawson Turner (Officer in Charge of the Radium Treatment at the Royal Infirmary, Edinburgh). A Case of Myeloma of the Sternum Treated by Radium. The British Medical Journal, August 7, 1915, p. 218. "A male, aged 32, suffering from a large myeloma of the sternum, was recommended to me with a view to radium treatment in the Royal Infirmary, Edinburgh, by Professor Gulland, on March 9th, 1915. The tumor had first been noticed two years before, after an attack of pleurisy; it had since steadily increased in size, and now consisted of a firm adherent growth about the size of a large cocoanut in front of the sternum. The circumference of the chest over the growth measured 37½ in. An X-ray examination suggested involvement of the mediastinum. The patient suffered from increasing weakness, from constriction of the chest, and shortness of breath. A consultation was held with Mr. Miles, who considered the case inoperable. In view of the size of the growth, and of the limited amount of radium at the disposal of the Royal Infirmary, I did not think much benefit would result from radium applications, but I said that if he were admitted to the wards, a vigorous course of treatment would be tried."

"This consisted in the introduction by Mr. Miles of four aluminium tubes containing 10 to 20 mg. each of pure radium bromide into the right hemisphere of the growth, while at the same time external applications through silver shields 0.5 mm. in thickness, were made. Thus the right hemisphere of the tumor was subjected to an energetic crossfire of rays. The plan of treatment was to transfer at the end of a few days the internal tubes to the left hemisphere, but owing to the rapid dimunition in the size of the growth it was not found practicable to introduce more than two of the tubes. The total dose amounted to 13,200 mg. hours. (7,075 mg. hours referred to radium element)."

"A month after the treatment the growth had entirely disappeared. Professor Gulland remarked, in regard to this case, 'that he had watched the tumor growing during the past eighteen months, that it was of very large size—quite as big as two fists—that he had been rather a sceptic as regards the value of radium in malignant disease, but that he was now quite converted. The growth was a myeloid sarcoma."

"The patient has regained his health and strength, and is back at his work."

"No tumor in my experience, is so amenable to radium as a myeloid sarcoma. When energetically treated they melt away in an extraordinary fashion."

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William James Morton. (New York). Imbedded Radium Tubes in the Treatment of Cancer. With Report of a Case of Sarcoma Remaining Cured Nine Years after Radiation. Medical Record, LXXXVI, pp. 913-15, Nov. 28, 1914. "In cases of cancer, in radium therapy as in surgery, a record of the permanency of favorable results is of prime importance. The patient here referred to remains well at the end of nine years, and may therefore be said to be "cured." Attendant points of interest are the utter hopelessness of relief by other measures, the method employed of low radioactivity and length of time of exposure, a Roentgengram of the imbedded tube in situ showing even the radium

salt within the tube, and a recent Roentgengram showing the healed humerus."

"The case was tentatively reported as an 'apparent cure at the end of two years,' in the MEDICAL RECORD of November 9, 1907, in a general article which covers essentially the entire ground of radium therapy as practised to-day, with the single exception of the elaboration of the system of filtration of the rays. A much condensed record from my private note book and from the records of the hospital follows:

"Miss L. V., aged 22. May 17, 1905. Referred by Dr. William Kemble of Kingston, N. Y. About one year previous to this date the patient noticed a swelling about the size of a walnut in the region of the upper third of the humerus. In six months the growth gradually increased to the size of a lemon. Accidentally striking her arm against a hard object a fracture occurred at the site of the tumor. The patient went to a hospital and a part of the growth was removed and pronounced to be cancer. A large tumor grew at the site of the incision and she then visited Dr. Kemble, who removed portions and had slides prepared at the Pathological Laboratory of the Post-Graduate Medical School. These were submitted to Dr. H. T. Brooks, who reported that they exhibited the 'histological features of sarcoma of spindle-cell variety.' The tumor was fusiform in shape, four inches in length, and two and one-half inches in width at its greatest diameter. Following the two operations an opening freely discharging pus remained, large enough to admit of the introducing a finger to a considerable depth. The patient had emaciated rapidly, had lost her appetite, presented extreme cachexia, and her skin was of a yellowish and sallow hue. No hope whatever was entertained of saving her life, but as a last resort amputation of the arm at the shoulder was proposed. This was rejected both by the patient and her mother. At the site of the growth, what little bone had survived the ravages of the disease had undergone spontaneous fracture and a splint was required for support."

"Soddy had sometime earlier suggested that a tube containing radium might with advantage be introduced within a malignant tumor. Radium salts of high radioactivity were not, as I now recollect, at that time (early in 1905), available, at least in this country. But I possessed a glass tube of radium chloride containing 100 milligrams, of an estimated radioactivity of 20,000. This tube gave excellent radium skiagraphs and I determined to insert it within the opening referred to and placed the patient in the Post-Graduate Hospital. The tube remained continuously within the wound for about six weeks. Within ten days there was a very great diminution of the discharge. At the same time the pain, which had been severe, ceased. Within five weeks the patient was able to dispense with the splint which she had worn constantly with heavy bandages and could move the arm freely and walk about. She had gained seven pounds in weight in a period of the first two weeks and showed every sign of returning health and vigor. The cancer growth receded steadily. About six weeks from the beginning of treatment the patient was discharged from the hospital and the tube was removed permanently, owing to the development of a severe second-degree radium dermatitis. This was presented by a vivid hyperemia, in places of a dusky hue, associated with a burning sensation and itching. The hyperemia extended peripherally outward from the focus of the wound, reaching almost to the elbow. Necrosis of the tumor tissue with breaking down and discharge occurred with a rise of temperature, on one day to 104° F., due to absorption of toxic material.

These cases of severe toxemia due to intensive raying and consequent resorption of decomposition products, with fever, nausea, vomiting, exhaustion, and fatigue are now well recognized and will be again referred to below. From this moment complete recovery was established. At the end of three months the wound after discharging less and less freely was nearly healed. The opening closed entirely in March, 1906."

"Case II, Carcinomatous tumor of the knee," also reported in the MEDICAL RECORD of November 9, 1907, with skiagraph of imbedded tube at the time of treatment, made continuous and rapid improvement, gained eleven pounds in weight, was relieved of all pain, regained the flexibility of the joint, showed no further evidence of tumor growth, and was discharged apparently well. I am informed that some years afterwards the patient died of general carcinosis. Another case, treated in 1907, but not yet reported, presents in brief this history:

"Primary carcinoma of the breast of the size of a large egg. Operation firmly refused. An incision into the center of the tumor was made for me by Dr. James N. West of this city. Microscopic examination of a piece of the tissue removed established the diagnosis of carcinoma. Into this incision I inserted a tube containing ten milligrams of pure radium bromide of an activity, as was the custom at that time to estimate it, of 1,800,000. The tube was left in place sixteen hours. A severe radium necrosis ensued, very slow to heal. Some time later on it was thought best on account of the slow healing of the wound simply to remove surgically the mammary gland involved. Microscopical examination showed, as reported by the surgeon who operated in a distant city, remaining cancer cells in the periphery of the broken-down area. The patient at this date (1914) seven years later has never shown any signs of recurrence of the disease and remains in perfect health."

"As to dosage, the radiotherapist has the choice of a small quantity of radioactive substance used over a long period or a large quantity over a short period. He may use five milligrams of a given radium salt twenty times as long as one hundred milligrams. Undoubtedly modern consensus of opinion is in favor of the massive dosage, viz., large quantity and short duration. But here a grave question meets the operator. So much cancer tissue may be caused to undergo necrosis that the patient may succumb to a resulting toxic effect due to the absorption of the necrosed material. This has been clearly proven by the experiments of A. V. Wassermann in mouse tumor treated by chemotherapy. In the case of tumors which had reached the size of a plum, if the breakdown of the tumor occurred rapidly the animal quickly sickened and died, while under a slower action the tumor, after liquefaction, was gradually absorbed. This happened regularly and left no doubt in the experimenter's mind that the animals died owing to the toxicity of the reabsorbed tumor mass."

"Herein will lie in many cases a favorable or unfavorable result, depending upon the expert knowledge and good judgment of the operator. In cases of large tumors quickly necrosed by over-massive doses of radium, it may be well that the issue of death has been determined by the sudden influx of the necrosed material thrown into the economy."

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Deutschmann, D.: Radiotherapy of Intra-Ocular Tumors. Ztscher. f. Augenh., 1915, xxxiii, 206. Deutschmann describes a case of sarcoma of the choroid which he treated with mesothorium. The capsule con-

taining the mesothorium was inserted through an incision in the conjunctiva and allowed to remain in place for an hour at the first treatment and later two hours. The tumor has almost entirely disappeared, but there were some traces of it left after six months, when the patient insisted on returning to his home in South America, and he has not been heard from since. Deutschmann thinks it possible there may have been a recurrence or metastasis, although to avoid the chance of metastasis he gave several injections of enzytol intravenously. He thinks that glioma of the retina is probably more amenable to radiotherapy than other forms of intra-ocular tumor. Surgery, Gynecology & Obstetrics. October, 1915.

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Kuepferle and von Szily. Radiotherapy of Hypophysis Tumor. Deutsche med. Wochenschr. XLI, pp. 910-11, July 29, 1915. The authors report the case of a man of 65 who had a cancer in the hypophysis partially removed by way of the orbit. A few months later vision was lost in consequence of the recurring growth of the cancer; but under intensive cross-fire Roentgen exposures combined with mesothorium radiations applied in the pharynx, vision gradually improved until it was 6/24 in one eye and with the other eye the patient could count fingers at half a yard. The eyesight has kept at this point for seven months to date. Beclere has reported four similar cases of improvement of symptoms of pressure from a hypophysis tumor under Roentgen exposures, and Gunsett has also published a case. In none in this last group has operative treatment been applied, and the exposures were less intensive than in Kuepferle and von Szily's case.

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The following notes were received too late to add to Dr. Delano's paper on "A Study of the Internal Therapeutics of Radium," in the October number:

To case XXX, page 5: The doctor writes under date of Sept. 27th, nine months after inception of treatment and five months after leaving off: "You will be pleased to hear that the patient referred to has not only held her own, but has continued to gain until now except for some remnant of stiffness and old deformity she is quite well."

To the description of "case of Psoriasis of 17 years, etc." (p. 11, paragraph following case XLVII): A letter received from patient under date of October 3rd, nine months after inception of treatment and four months after last radium: "I thought you might be interested to know that the after effects of radium have certainly worked a wonderful change in my system and at present I am practically freed from it. I still have a few, perhaps six or eight, very small spots the size of a pea, but they are all on the way to disappear. I have been feeling fine all Summer too and have been on the steady grind with plenty of work."

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NOTES AND COMMENTS

Practically all spring waters that are radioactive owe their activity to the presence of radium emanation, a gaseous radioelement which loses half its activity in about four days. There are no known springs where radium salts occur in notable concentration, and so it may safely be said that any therapeutic claim made for bottled natural spring waters, which are based on the "radioactivity" of the water, are fradulent. There is no method whereby the decay of radium emanation can

be prevented and this limits the use of emanation preparations locally where the preparations can be delivered and used promptly before the radioactive substance decays. Radium and radio-activity are excellent capital for the quacks and fakers, who take advantage of the general ignorance in regard to the subject of radioactivity to fool the public, and frequently the well intentioned physician is at a loss to advise in such matters because of his own ignorance of the subject. An example of water probably containing radium emanation is the "Mountain Valley Water" which has been widely advertised in St. Louis, Chicago, New York, Philadelphia and Pittsburgh. In one circular the statement is made that "the price of Mountain Valley Water is high because it must be shipped in galvanized steel barrels in order to prevent the radium gases from escaping. The springs are 12 miles from a railroad station in the Ozark Mountain, and the barrels must be hauled from Hot Springs, Arkansas, to Mountain Valley Springs and back again, making a 24 mile haul over rough roads." The following paragraph from the "Propaganda for Reform" is quoted from the Journ. Am. Med. Assn., July 24, 1915, (p. 350), and goes to show that in spite of the galvanized steel barrels the "radium gases" did escape, and the part that did not escape, disintegrated, so that the water when used by the purchaser would have little or no advantage over ordinary potable water.

Some "Mountain Valley Spring Water of Arkansas" was shipped in interstate commerce with the following claims appearing on the packages:

"World's best water for kidney and bladder troubles."

"Is Radio-Active Mountain Valley Water."

"A Remedy for Bright's Disease, Diabetes, Cystitis and Rheumatism."

"This product was declared misbranded by the federal authorities on the ground that the statements that the water was radio-active and was 'a remedy for Bright's Disease, Diabetes, Cystitis and Rheumatism,' were false, fradulent and misleading. The government further declared 'said water was not radio-active, and was not a remedy for Bright's disease, diabetes, cystitis and rheumatism.' The Mountain Valley Water Company admitted the allegation and judgment of condemnation and forfeiture was entered. The company paid the cost of the proceedings, and after executing a bond in the sum of $500 was permitted to take possession of the water.—(Notice of Judgment, 3627)."

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The Cost of Radium.

Below we quote in full a letter from Mr. L. O. Howard of Salt Lake City, to the Editor of the Mining and Scientific Press, which was published in that journal Sept. 25, 1915.

"The Editor:—

"Sir:—On page 406 of your issue of September 11, it is stated that 'The fact that the Bureau of Mines has reduced the cost of producing radium to $36,050 per grain of bromide will perhaps make a visit to the radium booths interesting.' Assuming this statement to be correct, except for the supposedly typographical error, which substitutes 'grain' for 'gram,' we are again subject to the skillful exaggeration which the Bureau used so successfully in its campaign against radium-producers early last year. This statement, in connection with the fact

that radium was selling for $120,000 per gram, is supposed to indicate either exorbitant profit for the so-called but mis-named radium Trust, or else very superior results by the metallurgists of the Bureau. Is either conclusion fully warranted? The price at which radium is sold is given in terms of the radium element, whereas the cost that you report is given in terms of the salt, radium bromide. In spite of the general use of the amount of the element as a standard in measuring radium by those familiar with the business, and most interested in disseminating precise information, many persist in using the obsolete basis of radium bromide, frequently not even taking the trouble to qualify the statements made by using radium bromide, but speaking only of radium, when radium bromide is intended. How long would we tolerate the use of the term lead instead of galena, for instance, by any intelligent and educated man? Yet an analogus situation with regard to radium goes almost unchallenged. Pure radium bromide ($RaBr_2$ $2H_2O$) contains 53.6% of radium element, which makes the cost of producing radium by the Bureau, when expressed in standard terms, $67,257 per gram, which is 'something else again.' Until the Bureau makes public the details that make up this cost in order that we may judge as to whether the cost of developing the process has been properly included, and what other items are or are not included, we can hardly, in fairness, consider that it has made out a clear case in favor of its contention, when all the diverse factors entering into this delicate process are given full weight. Is the price of radium exorbitantly high for the product of a new industry?"

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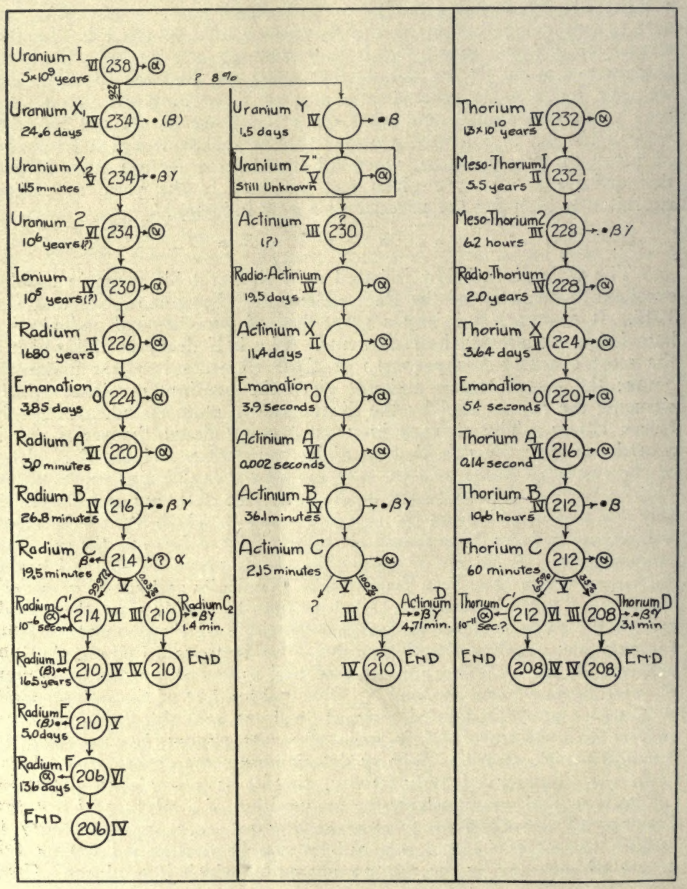
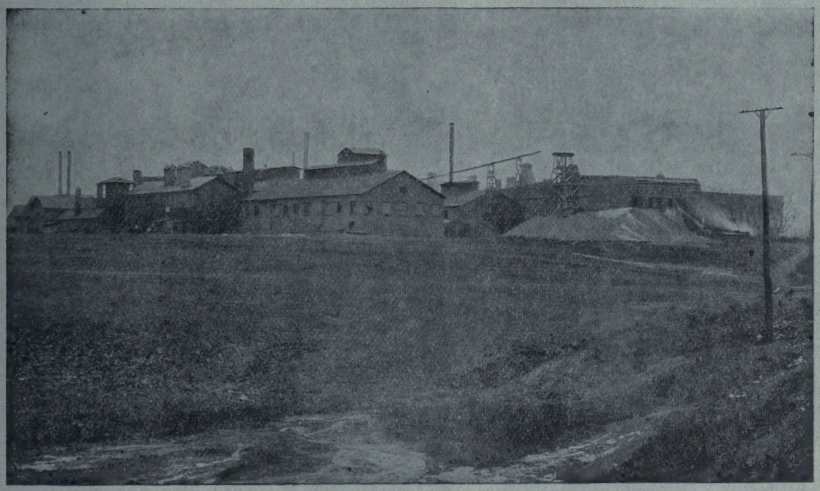
The table given below is based on a similar table given in Soddy's excellent "Chemistry of the Radio-Elements," Longmans, Green & Co., 1915. It summarizes briefly a great deal of our chemical and physical knowledge concerning these elements. The half decay period which is the most characteristic property of these elements is given under the name; the large Roman numeral gives the maximum valence of the element; the ray emitted by the disintegrating atom is indicated by the Greek letters. The changes in valence going down the series are in accordance with the rule that an alpha ray change reduces the valence of the resulting atoms by two, whereas a beta ray change increases the valence by one. As indicated in the table, the actinium series is probably due to a branching in the uranium series in which 8% of the atoms disintegrate to form the actinium series, the balance forming the uranium-radium series. Elements of nearly the same atomic weight and having the same valence have been found to be chemically and spectroscopically identical. These elements are called isotopes by Soddy since they would occupy the same position in the periodic table of the elements. Thus, for example, uranium 1 and uranium 2 are isotopes. Ionium, thorium, uranium X, and radiothorium are isotopes, as are also radium, actinium X, mesothorium 1 and thorium X. The end product of the radium series is isotopic with the known element lead, as are also radium B and radium D. Mixtures of isotopic elements cannot be separated by chemical means, and it is only by determining some characteristic based upon the property of radioactivity, that it is possible to determine qualitatively and quantitatively the composition of a mixture of isotopes. Commercial mesothorium owes a varying per cent. of its activity to radium (about 25%) and this radium can be determined with a fair degree of accuracy by the radium emanation which it produces. Com-

mercial radium prepared from carnotite contains only most minute traces of mesothorium, which produces less than 0.1 per cent. of the penetrating radiation. The accuracy of the gamma ray measurements is of the order of 0.5 per cent. and the quantitative estimation of the exceedingly minute amounts of mesothorium present in radium prepared from carnotite or pitchblende ore presents some difficulty. The method used depends upon the production by the mesothorium of radiothorium, and thorium emanation, which can be separated and roughly estimated by electrometric methods. It is interesting to note that the half decay periods of thorium and uranium are the longest of any of the radio-elements, 13,000 and 5,000 million years respectively, and it is because of the slowness of these parent elements in disintegrating that there are still radio-elements in existence.



STANDARD CHEMICAL COMPANY

PITTSBURGH, PA.



Reduction Mill of Standard Chemical Co., Canonsburg, Pa.

Miners of Uranium and Vanadium Ores, and Producers of Radium

STANDARD CHEMICAL COMPANY

Send for Descriptive Literature on

"Standard" Radium Solution for Drinking

"Standard" Radium Solution for Intravenous Use

"Standard" Radium Compress

"Standard" Radium Solution for Bathing

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We can make guaranteed delivery of Radium Element in the forms of

Radium Sulfate
Radium Bromide
Radium Chloride
Radium Carbonate

of any desired concentration (purity)

Radium Chemical Company

General Offices and Laboratories

Forbes and Meyran Avenues, Pittsburgh, Pa.